CLAIMS

What is claimed is:

1. An underwater imaging system, comprising:

an acoustic source configured to generate an acoustic wavefront for impinging upon a target object;

a first screen having first and second sides, said first side configured to receive a reflected acoustic wavefront as reflected from said target object, said first and second sides further configured to physically deform in response to said reflected acoustic wavefront; and

a first optical processing system optically coupled to said second side of said first screen for converting said reflected acoustic wavefront on said second side of said first screen to a first optical intensity image of said target object.

2. The system of claim 1, further comprising an acoustic lens arranged between said target object and said first screen and further configured to acoustically process said reflected acoustic wavefront.

3. The system of claim 1, wherein said first screen is further configured to partition said system into a wet side and a dry side and wherein said optical processing system is arranged on said dry side.

4. The system of claim 3, further comprising an acoustic lens arranged on said wet side between said target object and said first screen.

5. The system of claim 1, wherein said first screen is configured as a monolithic screen to directly physically deform from said first side to said second side.

6. The system of claim 2, wherein said first screen and said acoustic lens are integral and said first screen is formed as a facet of said acoustic lens.

7. The system of claim 1, wherein said first screen comprises:

an imaging screen configured to receive a reflected wavefront and physically deform in response thereto;

a pressure compensating layer internally adjacent to said imaging screen and configured to neutralize underwater pressure against said imaging screen; and

a rigid backplane adjacently coupled to said pressure compensating layer and further configured for coupling with said first optical processing system.

8. The system of claim 1, further comprising a second screen and a second optical processing system configured to generate a second optical intensity image of said target object, said second screen and second optical processing system spatially separated from said first screen and said first optical processing system to form a stereophonic optical image of said target object.

9. A method for imaging underwater objects comprising:

ensonifying a target object with an acoustic wavefront;

deforming a first side of a first screen and a second side of said first screen in response thereto with a reflected acoustic wavefront as reflected by said target object; and

converting said reflected acoustic wavefront on said second side of said first screen into a first optical intensity image of said target object.

10. The method of claim 9, wherein said converting comprises:

modulating a reference wavefront with deformations on said second side of said first screen;

combining in a sensing medium an object wavefront with said reference wavefront as modulated; and

generating a first optical intensity image of said target object as combined in said sensing medium.

11. The method of claim 9, wherein said converting comprises:

projecting an optical wavefront on said second side of said first screen; and

generating a first optical intensity image of said target object from modulation of said first optical wavefront induced by deformations of said first screen from said reflected acoustic wavefront.

12. The method of claim 9, further comprising:

deforming a first side of a second screen and a second side of said second screen in response thereto with a reflected acoustic wavefront as reflected by said target object; and

converting said reflected acoustic wavefront on said second side of said second screen into a second optical intensity image of said target object, said first and second optical intensity image forming a stereophonic optical intensity image of said target object.

13. The method of claim 9, further comprising acoustically modifying said reflected acoustic wavefront between said target object and said first screen through an acoustic lens.

14. The method of claim 9, further comprising acoustically modifying said reflected acoustic wavefront between said target object and said first screen through an acoustic lens, said first screen and said acoustic lens being integrally arranged.

15. An underwater camera, comprising:

a first screen having first and second sides, said first side configured to receive a reflected acoustic wavefront as reflected from a target object, said first and second sides further configured to physically deform in response to said reflected acoustic wavefront; and

a first optical processing system optically coupled to said second side of said first screen for converting said reflected acoustic wavefront on said second side of said first screen to a first optical intensity image of said target object.

16. The underwater camera of claim 15, wherein said first screen further partitions said underwater camera into a wet side on said first side of said first screen and a dry side on said second side of said first screen, said first optical processing system located within said dry side.

17. The underwater camera of claim 15, further comprising an acoustic lens arranged between said target object and said first screen and further configured to acoustically process said reflected acoustic wavefront.

18. The underwater camera of claim 17, wherein said first screen and said acoustic lens are integral, said first screen being a facet of said acoustic lens.

19. The underwater camera of claim 15, further comprising an acoustic source configured to generate an acoustic wavefront for impinging upon a target object.

20. The underwater camera of claim 15, wherein said first screen is configured as a monolithic screen to directly physically deform from said first side to said second side.

21. The underwater camera of claim 15, wherein said first screen comprises:

an imaging screen configured to receive a reflected wavefront and physically deform in response thereto;

a pressure compensating layer internally adjacent to said imaging screen and configured to neutralize underwater pressure against said imaging screen; and

a rigid backplane adjacently coupled to said pressure compensating layer and further configured for coupling with said first optical processing system.

22. The underwater camera of claim 15, wherein said first screen is contoured on said second side to optically reflect an object beam of said first optical processing system.

23. The underwater camera of claim 15, further comprising a second screen and a second optical processing system configured to generate a second optical intensity image of said target object, said second screen and second optical processing system spatially separated from said first screen and said first optical processing system to form a stereophonic optical image of said target object.